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ABSTRACT

It is particularly difficult to make accurate enrollment projections for areas that are experiencing a rapid expansion in their population. The traditional method of calculating cohort survival ratios must be modified and supplemented with additional information to ensure accuracy; cost projection methods require detailed analyses of current costs to establish standards for computing future costs in relation to expected growth. Based on calculations from the gold ore boom town of Round Mountain, Nevada, this paper presents a framework for estimating the added costs associated with population growth for the local public school system. Formulas for figuring growth impact on education and cost of construction are attached. (KM)

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Calculating the Financial Impact of Population Growth on Education

A Paper Presented Before the Third Annual Conference of Northern Rocky Mountain Educational Research Association

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INTRODUCTION

Sudden major changes are occurring in many communities as a result of the development of large mining operations, production of alternative energy sources, accelerated military defense projects, or the demise of heavy industry. Growth is particularly rapid in western and southwestern sections of the United States while some other areas of the country are experiencing decline or are remaining relatively stable. These conditions often pose complex planning problems for school officials.

The National School Planning Laboratory at the University of Nevada-Reno conducts individually tailored studies for school districts to examine the future impact that changing demographic conditions will have on school enrollments, school facilities, staffing patterns, and other aspects of school operations. These studies assist school districts with difficult decisions regarding new construction, new personnel, school closure, or reduction in force. It is vital that reliable methods be used for projecting growth or decline as well as costs associated with growth. This paper presents a framework for estimating the added costs of population growth. The method was adapted from the previous work of Rimbey and Meyer of the College of Agriculture at the University of Idaho (1981) and is being put to use on an experimental basis at the National School Planning Laboratory.

Making projections of any kind in the field of education is risky business at best. It is particularly difficult to make accurate enrollment projections in rapid growth expansion circumstances as is currently the situation in many areas of Nevada and other western states. Traditional methods such as calculating cohort survival ratios must be modified and supplemented with a great deal of additional information to ensure accuracy. Such detailed information is costly to gather but necessary to reliably plan additional programs

and facilities.

Cost projection methods require a detailed analysis of current costs to establish standards for calculating future costs in relation to expected growth. Averages can be used for such factors as salaries or pupil/teacher ratios, but they will vary from location to location so local standards should be researched. Construction costs will also vary with location because of shipping costs for building materials. For example, in Nevada the cost for constructing a school in an urban area is about $72.00 a square foot but in rural areas the cost is closer to $80.00. These figures include site acquisition. The standards in Table 1 are fairly typical for the numerous factors which go into cost calculations.

An Example From Nevada

Round Mountain, Nevada is a tiny desert community about 35 miles from the county seat and school district headquarters at Tonopah in Nye County. The Nye County school system covers an area of 18,000 square miles and is the largest school district in the 48 contiguous states as far as land is concerned. The town of Round Mountain was a sizeable mining town during the gold rush days of the last century but less than 50 people at any one time have lived there since 1900 - until recently.

During 1982 a mineral exploration company discovered a 200 million ton gold ore deposit and began to develop a gigantic mining operation on the door steps of Round Mountain residents; the mountain for which the town was named is being removed.

Construction work for mills, smelters and a new town site is bringing hundreds of workers to the once deserted area and the fifteen year operation phase of the mine will bring hundreds more.

TABLE 1

STANDARD FOR CALCULATING EDUCATION'S COST

1. 260 students per 1000 population
2. Student/teacher ratio = 21 to 1
3. Average teacher salaries = $17,500
4. Average princials salary = $29,000
5. Average vice principals salary = $26,000
6. Average counselor salary = $21,000
7. Principal/student ratio = 1,800 to 1
8. Vice principal/student ratio = 600 to 1
9. One counselor for 300 students
10. Clerical salaries = $14,000
11. One clerical position for 15 staff
12. Salaries account for 80% of instructional costs
13. Transportation is 3¢ per student mile; 50% of students are bused 30 miles per day times 186 days
14. Maintenance and operation are 15% of total instructional costs
15. Benefits are 21% of instructional salaries
16. School population is 50% K-6, 20% 7-8, and 30% 9-12
17. Square footage per student is
    125 = high school
    75 = junior high
    55 = elementary
18. Cost per foot = $ 80.00
19. Financing is assumed to be 10% for 30 years

Our research team which surveyed Nye County for probable growth has estimated there will likely be 3,200 new citizens in the area when the mining operation reaches its peak. Using, in this case, the standard of 260 students per 1000 population it is estimated the county will have to provide facilities and staff for approximately 832 new students, an increase of 32% for the whole school district. This is the beginning point from which to calculate the financial impact this growth will have on the district.

By consulting the worksheets for calculating new costs associated with population growth, it can be seen that several classes of expenditures will need to be calculated:

1. Total instructional operating costs
    a) salaries
    b) benefits
    c) supplies, materials
    d) maintenance, operation
    e) transportation
2. Cost of construction
    a) elementary schools
    b) junior high schools
    c) high schools

It is a relatively simple matter to calculate new instructional operating costs. The standards listed in Table 1 were used in the cost projections reported in the example worksheets for the impact on Nye County schools of the 832 new students connected with the mining operation. As was mentioned earlier, the standards will vary by district and should be locally researched. The reader should also be cautioned that cost projections cannot always be made solely on the basis of projected new enrollments: new construction as

well as instructional costs will be affected by whether or not the district decides to house new students and existing students in the same or different facilities; on the one hand, fewer administrative staff may be required than would ordinarily be projected in relation to new enrollments if one facility is required instead of two; on the other hand, capital outlay costs may increase if one facility is required to house, for example, new and existing high school students.

To illustrate, lets use the example of Nye County schools. Because of the new growth, the citizens of Round Mountain wanted a new high school which, if constructed, would have placed it only 35 miles from an existing junior-senior high school in the town of Tonopah. A new high school for Round Mountain would have accommodated the increase of 415 students, grades eight through twelve (see the completed worksheets), but the school would have been abandoned by the year 2000 when the mine closed down. Instead, the district adopted the following plan:

1. Build a new elementary school, K-6, for Round Mountain 416 new elementary students.
2. Build a new high school in Tonopah for the existing enrollment of 375 high school students but large enough to house the additional 249 students from Round Mountain and bus those students to Tonopah.
3. Convert the existing junior-senior high school into a junior high school and bus the junior high students from Round Mountain.

This plan affected future costs in two ways: a need to add a high school vice principal, construction of a 76,000 square foot facility instead of 32,000 square feet, a much larger bond issue was needed, and annual capital costs rose. If only the costs associated with an influx of new students were

calculated, the district would have planned for a total education costs of roughly $6,300,000, including a $5,000,000 bond issue. Instead, they were faced with a total education cost of roughly $9,382,999 which included an 8 million dollar bond issue. In the long run, the more expensive option was in the best interests of the district.

The cost calculations for educational impact from a new mining operation in our Nevada example were made as follows:

* Number of new students derived from an expected increase of 3200 residents:

  3200 x .260 students per 1000 = 832 students

  (a further breakdown by K-6, 7-8, and 9-12 Grade levels was made)

* Number of new teachers from student/teacher ratios:

  832 students ÷ 21 = 40 new teachers

  (similar calculations for administrators and counselors)

* New teacher salaries:

  $17,500 average salary x 40 teachers = $700,000

* New clerical staff, one for fifteen faculty:

  43 teachers and ancillary faculty ÷ 15 = 2.9 clerical (or 3)

* Clerical salaries:

  $14,000 average x 3 staff = $42,000

* Principals' salaries:

  $29,000 average x 1 = $29,000 (principal)

  $26,000 average x 1 = $26,000 (vice principal)

* Counselors salaries:

  $21,000 average x 1 = $21,000

* Instructional salaries:

  teachers + administrators + counselors + clerical = $818,000

* Benefits:

  $818,000 x .21 = $171,780

* Supplies and materials:

  $818,000 + $171,780 x .20 = $197,956 (1,187,736)

* Maintenance and operation:

  $1,187,736 x .128 = $152,030 ($1,339,076)

* Transportation:

  .03 per student mile x 70 miles per day x 186 days bused x 416 students = $162,489

* Total instructional operating:

  Salaries + benefits + supplies + maintenance + transportation ($1,502,255)

Capital Outlay:

* Elementary construction:

  416 students x 55 sq. ft. per student x $79.00 per ft. = $1,7807,520

* High school construction (junior high construction not figured in this example):

  615 students x 125 sq. ft. per student x $79.00 per ft. = $6,073,125

* Total capital costs:

  $1,807,520 + $6,073,125 = $7,880,646

CONCLUSIONS

The cost projection method described above used an average of 260 students per 1000 population. This figure is simple to obtain if the total current population of the attendance area being studied is known, which is

not always the case in growing communities since census data are not always current. While a local community standard such as 260 students per 1000 may be accurate over a period of time in relatively stable communities, areas experiencing rapid growth expansion would very likely end up with a different standard under certain circumstances, depending upon the sources of the rapid growth. For example, permanent residents such as teachers, police, or business persons tend to have families with different numbers of children per family than do construction workers or other types of workers. If a very large project is expected such as a mining operation with a sizeable development phase for construction of mills the project will have to be individually treated. This may involve interviews, a review of environmental impact statements, analysis of company plans to determine planned workforce size, over time, or surveys of workers to determine the percentage of families in the entire workforce and the average number of children per family. While these data are expensive to gather, having the data could prevent costly errors.

The method of calculating cost of instructional program growth presented here is based upon standard classes of expenditure found in any school district budget. For capital outlay projects the method of multiplying square footage costs by number of desired square feet per student by total number of students is fairly reliable. For all calculations, the critical factor is determining accurate standards on which to base projections, and care should be exercised.

GROWTH IMPACT ON EDUCATION

Number of New Students = Students per 1000 x New Resident

Elementary Students = K-6 percentage x Total

Jr. High Students = 7-8 percentage x Total

Secondary Students = 9-12 percentage x Total

1. Number New Teachers = Number New Students ÷ Student/Teacher Ratio
2. Teacher Salaries = Actual Average x Number of Teachers
3. Principals Salaries = Actual Average x Number Needed
4. Vice Principals Salaries = Actual Average x Vice Principals Needed
5. Counselors Salaries = Actual Average x Number of Counselors
6. Number of Clerical Staff = Number of Faculty ÷ Faculty/Clerical Ratio
7. Clerical Salaries = Actual Average x New Clerical Staff
8. Total New Salaries = New Teachers Salaries x New Principals Salaries + Vice Principals Salaries + Counselor Salaries + Clerical Salaries
9. Fixed Charges = New Salaries x Percentage for Benefits
10. Total Instructional Cost = New Salaries + Fixed Charges + Supplies, Materials
11. Maintenance, Operation = Total Inst. Costs x Percentage (e.g. .128)

12. Transportation Cost = Cost Student Mile x Miles Per Day x Days Bussed x Number of Students

13. Total Operating = Instructional Cost + Maintenance, Operation + Transportation

COST OF CONSTRUCTION

14. Elementary Construction = Number of Students x Square Foot x Cost Sq. Foot ($79)

15. Jr. High Construction = Number of Students x Square Foot x Cost Sq. Foot ($79)

16. High School Construction = Number of Students x Square Foot x Cost Sq. Foot ($79)

17. Total Capital Costs = High School + Elementary + Jr. High

18. Annual Capital Cost = Total Capital Costs x Ammortization Rate

19. Total Education Costs = Capital Costs + Total Operating

Nye County Estimated
GROWTH IMPACT ON EDUCATION

	832 Number of New Students	=	.260 Students per 1000	x	3200 New Resident	
	416 Elementary Students	=	.50 K-6 percentage	x	832 Total	
	166 Jr. High Students	=	.20 7-8 percentage	x	832 Total	
	249 Secondary Students	=	.30 9-12 percentage	x	832 Total	
1.	40 Number New Teachers	=	832 Number New Students	÷	21:1 Student/Teacher Ratio	
2.	700,000 Teacher Salaries	=	17,500 Actual Average	x	40 Number of Teachers	
3.	29,000 Principals Salaries	=	29,000 Actual Average	x	1 Number Needed	
4.	26,000 Vice Principals Salaries	=	26,000 Actual Average	x	1 Vice Principals Needed	
5.	21,000 Counselors Salaries	=	21,000 Actual Average	x	1 Number of Counselors	
6.	3 Number of Clerical Staff	=	43 Number of Faculty	÷	15:1 Faculty/Clerical Ratio	
7.	42,000 Clerical Salaries	=	14,000 Actual Average	x	3 New Clerical Staff	
8.	818,000 Total New Salaries	=	700,000 New Teachers Salaries	x	29,000 New Principals Salaries	+
	26,000 Vice Principals Salaries	+	21,000 Counselor Salaries	+	42,000 Clerical Salaries	
9.	171,780 Fixed Charges	=	818,000 New Salaries	x	.21 Percentage for Benefits	
10.	1,187,736 Total Instructional Cost	=	818,000 New Salaries	+	171,780 Fixed Charges	+
	197,956 Supplies, Materials					
11.	152,030 Maintenance, Operation	=	1,187,736 Total Inst. Costs	x	.128 Percentage (e.g. .128)	

12. 162,489 (Transportation Cost) = .03 (Cost Student Mile) x 70 (Miles Per Day) x 186 (Days Bussed) x 416 (Number of Students)

13. 1,502,255 (Total Operating) = 1,187,736 (Instructional Cost) + 152,030 (Maintenance, Operation) + 162,489 (Transportation)

COST OF CONSTRUCTION

14. 1,807,520 (Elementary Construction) = 416 (Number of Students) x 55 (Square Foot) x $79.00 (Cost Sq. Foot ($79))

15. NO CONSTRUCTION NECESSARY (Jr. High Construction) = (Number of Students) x (Square Foot) x (Cost Sq. Foot ($79))

16. 6,073,125 (High School Construction) = 615 (Number of Students) x 125 (Square Foot) x $79.00 (Cost Sq. Foot ($79))

17. 7,880,645 (Total Capital Costs) = 6,073,125 (High School) + 1,807,520 (Elementary) + 0 (Jr. High)

18. 835,970 (Annual Capital Cost) = 7,880,645 (Total Capital Costs) x .106079 (Ammortization Rate)

19. 9,382,900 (Total Education Costs) = 7,880,645 (Capital Costs) + 1,502,255 (Total Operating)